New Kr Cross Sections and Astrophysical Constraints on Presolar Grains

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Isotopes between Fe and Sr are mainly synthesized by the so-called weak s-process component through the activation in massive stars of the ^{22}Ne(α,n)^{25}Mg neutron source during core-He or shell C-burning evolutionary phases. Their abundances are also partially contributed by the main s-process component, which is responsible for the production of heavier elements from Y up to Pb. This component has been associated to shell He-burning during the AGB evolutionary phase in low mass carbon stars. According to the most recent double pulse s-process model the neutron exposure per pulse, which determines the overall s-process efficiency, is built by the ^{13}C(α,n) neutron source, while a minor burst of neutrons driven by the ^{22}Ne(α,n) reaction, involving higher neutron density, largely modifies the final isotopic distribution of reaction-branching dependent nuclides. The measured large spread in the in the ratio ^{86}Kr/^{82}Kr found in silicon carbide (SiC) grains of different size is an indirect confirmation of the double pulsed nature of the s-process in carbon stars. Indeed, the marginal activation of the ^{22}Ne neutron source produces a relatively short (in time) but intense neutron burst of high peak neutron density. In these conditions the neutron-rich channel at ^{85}Kr branching in the s-process path is partially open providing the necessary ^{86}Kr abundance. This branching is of great interest because can deliver essential information on the neutron flux in the specific stellar site. With the aim to improve the knowledge of the neutron capture cross section of the principal Krypton isotopes and therefore to reduce the uncertainties on the s-process models, the neutron capture cross section of ^{82}Kr, ^{84}Kr and ^{86}Kr, on both resolved and unresolved resonance regions, have been measured with high resolution at the GELINA facility in Geel. The Maxwellian-averaged capture cross section versus stellar temperature has been calculated. In addition, a partial analysis of ^{80}Kr and ^{83}Kr resonances in a limited energy range has been also carried out.

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